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## Adaptive optics wide-field microscope corrections using a MEMS DM and Shack-Hartmann wavefront sensor

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### Public Summary:

We demonstrated the use of an adaptive optic system in biological imaging to improve the imaging characteristics of a wide field microscope. A crimson red fluorescent bead emitting light at 650 nm was used together with a Shack-Hartmann wavefront sensor and deformable mirror to compensate for the aberrations introduced by a Drosophila embryo. The measurement and correction at one wavelength improves the resolving power at a different wavelength, enabling the structure of the sample to be resolved (510 nm). The use of the crimson beads allows for less photobleaching to be done to the science object of the embryo, in this case our GFP model (green fluorescent beads), and allows for the science object and wavefront reference to be spectrally separated. The spectral separation allows for single point sources to be used for wavefront measurements, which is a necessary condition for the Shack-Hartmann Wavefront sensor operation.

### Scientific Abstract:

We demonstrated the use of an adaptive optic system in biological imaging to improve the imaging characteristics of a wide field microscope. A crimson red fluorescent bead emitting light at 650 nm was used together with a Shack-Hartmann wavefront sensor and deformable mirror to compensate for the aberrations introduced by a Drosophila embryo. The measurement and correction at one wavelength improves the resolving power at a different wavelength, enabling the structure of the sample to be resolved (510 nm). The use of the crimson beads allows for less photobleaching to be done to the science object of the embryo, in this case our GFP model (green fluorescent beads), and allows for the science object and wavefront reference to be spectrally separated. The spectral separation allows for single point sources to be used for wavefront measurements, which is a necessary condition for the Shack-Hartmann Wavefront sensor operation.

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